

WHAT IS CLAIMED IS:

1. An image processing system for encoding and decoding an image, comprising:

an encoding device for encoding the image in  
5 units of bit planes to generate a code sequence; and  
a decoding device for decoding the code sequence  
in units of bit planes to generate the image,

wherein noise on the image is removed by deleting  
data of bit planes of levels lower than a lower-limit  
10 bit plane in said encoding device and/or said decoding  
device.

2. The system according to claim 1, wherein the  
lower-limit bit plane is determined on the basis of  
information that pertains to the image sensing  
15 situation.

3. The system according to claim 1, wherein the  
image to be encoded by said encoding device is an X-ray  
image, and

the information that pertains to an image sensing  
20 situation is an X-ray dosage.

4. The system according to claim 1, wherein said  
encoding device performs discrete wavelet  
transformation.

5. The system according to claim 4, wherein said  
25 decoding device deletes data of bit planes of levels  
lower than the lower-limit bit plane, of bit planes  
which belong to a predetermined subband.



12. The system according to claim 1, further comprising an image display device for displaying the image decoded by said decoding device.

13. The system according to claim 1, wherein said  
5 encoding device determines a region of interest in the image, and removes noise by deleting data of bit planes of levels lower than the lower-limit bit plane for only a region other than the determined region of interest.

14. The system according to claim 13, wherein said  
10 encoding device shifts up only the region of interest by a predetermined number of bits by multiplying data of the region of interest by a predetermined value, and removes noise by deleting data of bit planes of levels lower than the lower-limit bit plane for the  
15 entire region after the shift-up process.

15. The system according to claim 14, wherein said encoding device determines the region of interest on the basis of a transform coefficient group included in the lowest-frequency range of transform coefficients  
20 generated by computing discrete wavelet transforms of an image.

16. The system according to claim 14, wherein said encoding device computes the predetermined number of bits to prevent levels of bit planes of the region of  
25 interest from overlapping levels of bit planes of a region other than the region of interest.



transform coefficients in the subband in accordance with the checking result.

22. The system according to claim 1, wherein said encoding device generates the code sequence by forming  
5 layers using only bit planes not less than the lower-limit bit plane, and combining the layers.

23. An image processing system for encoding and decoding an image, comprising:

an encoding device for generating a code sequence  
10 by generating transform coefficients in units of a plurality of frequency ranges by means of frequency transformation of an image, and encoding the transform coefficients; and

a decoding device for restoring the transform  
15 coefficients from the code sequence, reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients, and removing noise by  
processing the transform coefficients of the frequency  
20 ranges other than the given frequency range on the basis of the reference image.

24. The system according to claim 23, wherein the given frequency range includes the lowest-frequency range of the plurality of frequency ranges.

25. The system according to claim 23, wherein the given frequency range includes a predetermined number



31. An image processing apparatus for encoding an image,

which generates a code sequence by encoding an image in units of bit planes, and removes noise on the image by deleting data of bit planes of levels lower than a lower-limit bit plane.

32. An image processing apparatus for decoding an image,

which reclaims an image by decoding an image in units of bit planes, and removes noise on the image by deleting data of bit planes of levels lower than a lower-limit bit plane.

33. An image processing apparatus for decoding an image,

which restores transform coefficients from a code sequence obtained by computing and encoding frequency transforms of an image, and reclaims a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients, and

removes noise by processing the transform coefficients of frequency ranges other than the given frequency range on the basis of the reference image.

34. An image processing method for encoding and decoding an image, comprising:

an encoding step of encoding an image in units of bit planes to generate a code sequence; and

a decoding step of decoding the code sequence in units of bit planes to generate an image,

wherein noise on an image is removed by deleting data of bit planes of levels lower than a lower-limit  
5 bit plane in the encoding step and/or the decoding step.

35. An image processing method for decoding an image, comprising:

a step of restoring transform coefficients from a code sequence obtained by computing and encoding  
10 frequency transforms of an image, and reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients; and

a step of removing noise by processing the  
15 transform coefficients of frequency ranges other than the given frequency range on the basis of the reference image.

36. A computer program product embodying a program for implementing an image processing method for  
20 encoding and decoding an image, the program comprising:

program code for an encoding step of encoding an image in units of bit planes to generate a code sequence; and

program code for a decoding step of decoding the  
25 code sequence in units of bit planes to generate an image,



wherein noise on an image is removed by deleting data of bit planes of levels lower than a lower-limit bit plane in the encoding step and/or the decoding step.

37. A computer program product embodying a program  
5 for implementing an image processing method for decoding an image, the program comprising:

program code for a step of restoring transform coefficients from a code sequence obtained by computing and encoding frequency transforms of an image, and  
10 reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients; and

program code for a step of removing noise by processing the transform coefficients of frequency  
15 ranges other than the given frequency range on the basis of the reference image.

38. A computer data signal embodied in a propagating wave and used for implementing an image processing method for encoding and decoding an image, comprising:

20 a code signal used in an encoding step of encoding an image in units of bit planes to generate a code sequence; and

a code signal used in a decoding step of decoding the code sequence in units of bit planes to generate an  
25 image,

wherein noise on an image is removed by deleting data of bit planes of levels lower than a lower-limit bit plane in the encoding step and/or the decoding step.

39. A computer data signal embodied in a propagating  
5 wave and used for implementing an image processing method for decoding an image, comprising:

a code signal used in a step of restoring transform coefficients from a code sequence obtained by computing and encoding frequency transforms of an image,  
10 and reclaiming a reference image on the basis of the transform coefficients of a given frequency range of the restored transform coefficients; and

a code signal used in a step of removing noise by processing the transform coefficients of frequency  
15 ranges other than the given frequency range on the basis of the reference image.

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